

ENVIRONMENTAL TAX REFORM SCENARIOS ANALYSIS

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Introduction

When looking for effective tools for the protection of the environment, the importance of economic instruments and their impact on the economy must not be overlooked. The triad – economics – environment – energy, commonly identified as the E3, is no doubt one of the most dynamically developing areas even at the EU level. All measures taken on behalf of the protection and intensification of the growth of one "E" factor, also have implications for the other remaining policies. The following article proposes the evaluation of the environmental tax reform as an economic tool for all of the E3 sectors.

Northern European countries had already started to institute carbon taxes in various forms during the 1990s [8]. Later on, some countries in Western Europe also joined this trend, and the European Community adopted the Directive No. 2003/96/ES in 2003 harmonising the taxing of energy products from fossil fuels in all the member states. All of this thus energised the coordinated application of the environmental tax reform (ETR) within the entire Union. The revised wording of the Directive introduces the carbon tax whereby it takes into account its carbon dioxide content, in addition to the amount of energy it contains [7]. The Czech Republic commenced the application of the ETR application in 2008. It initially focused on the implementation of the Union Directive and then imposed an excise tax on fossil fuels. The reform will, it is assumed, be completed in 2017 when the carbon tax is supposed to be implemented in full. However, a scenario with a slower application pace with longer transition periods aimed at avoiding price shocks is also a distinct possibility [15].

This article deals with the possible ETR impacts on the CO₂ emissions, the GDP and

the employment situation in the Czech Republic. Three studies have been selected from a wide range of published articles: Ekins [3], the European Environment Agency (EEA) [6] and Ščasný et al. [14]. These authors elaborated a range of different scenarios reflecting various oil-prices, carbon-prices, greenhouse gas emission targets, revenue recycling methods and scales of ETR. The main aim is to verify the conclusions of selected scenarios and outline prerequisites for the ETR implementation in the Czech Republic.

1. Methods and Previous Research

The ETR has been the focus of attention on the part of many researchers who have devoted their thoughts to various aspects of environmental taxes in their studies. Bosquet [1] has carried out an extensive analysis of the ETR double dividend. In addition to benefits in the environmental area, he sees the positive short-term impact on the employment rate and somewhat questionable influence on the production process, provided inflation is prevented in both cases. According to Ekins [4] and Speck [5], the ETR influence on the degree of competitiveness is positive because the future competitive advantage of the source arises from the application of low-carbon technologies. Miguel and Manzano [12] deal with the benefits resulting from the gradual and single-shot ETR reform. According to Kosonen [10], the frequently discussed regression tendency of environmental taxes is not necessarily a given. It depends on the intensity of transport taxation because it burdens more medium- and high-income households and thus the tax burden for low-income households caused by energy taxation thereby becomes partially neutralised.

Several methods are used for clarification purposes of the broad spectre of the ETR

effects. CGE, E3ME and GINFORS models are the most widespread.

CGE (Computable General Equilibrium) modeling represents the traditional equilibrium-rationality theory of mainstream economics and serves as an analysis of resource allocation and income distribution issues in market economies. The model describes the interdependence among markets on numerous sets of equations. The majority of studies with neoclassical theoretical starting points, concluded that the optimum rate of environmental taxes should be less than the limit to social costs

incurred by atmospheric pollution. Jaeger [9] in his work reached a different conclusion. He supports his argumentation with the assumption that environmental damage has an immediate impact on the decline of labour effectiveness (not directly to the consumer's advantage) and, thus, the tax rate should be higher than the limit to social costs. In this case, even the conclusions ensuing from the research using the CGE model benefit the so-called "environmental taxes double payoff" and, consequently, have an impact on the reduction of emissions and the growth of employment.

Tab. 1: Scenarios Comparison

EEA	Etkins	Ščasný, Píša, Pollitt
BH: baseline scenario, high oil price, reference scenario for comparison	Baseline scenario: based on the "PRIMES" forecast (updated 2008)	S1: based on second phase of ETR in the Czech Republic, taxation of stationary sources, gradually increasing of rates
S1H: high energy price, revenue recycling, GHG 2020 target	LS1: unilateral GHG 2020 target, tax on material input, revenue recycling	S2: carbon taxation of emissions from stationary sources
S2H: high energy price, revenue recycling, GHG 2020 target, 10 % of revenues on eco-innovation	HS1: high energy price, unilateral GHG 2020 target, tax on material input, revenue recycling	S3: carbon taxation of emissions from stationary sources and transport
S2HE: high energy price, revenue recycling, GHG 2020 target, 10 % of revenues on eco-innovation, increase of EU trade shares in machinery and electrical machinery by 0.1 %	H2S: higher emissions cuts than in unilateral GHG 2020 targets, the rest of the world takes action as well, high energy price, revenue recycling	
S2HI: high energy price, revenue recycling, GHG 2020 target, 10 % of revenues on eco-innovation, increase of EU trade shares in machinery and electrical machinery by 0.1 %, major influence of the German RES industry		

Source: own elaboration, data from the EEA [6], Ekins [3] and Ščasný [14]

The model E3ME is a dynamic multicountry/multisector integrated economic-energy-environment model as the GINFORS. Compared to the CGE model, it clarifies the existing behavioural patterns. Its architecture is split into triad interconnected modules of economy, energy and environment, which cover the EU countries and 20 other world regions are treated as exogenous. GINFORS and E3ME are both based on "new economics" related to the chaos

theory. The input data are taken from the Eurostat and the OECD databases and arranged in a set of historical time series of economical variables with long-term links and then entered into algorithms developed within Cambridge Econometrics. The Ščasný et al. paper is analyzing the environmental taxation with the E3ME model [14].

The model GINFORS (Global INTERindustry FORecasting System) is used for simulating

the E3 link to the international trade. The axis of the model is the bilateral trade model, from which in a similar fashion to the spokes, radiate the country models. They consists of the macro model, the input-output model and the energy-emission model. The upgraded version of the model GINFORS is enlarged by the material-input model and the land-use model. The linkage of the trade model with other models for each country and the transactions between states are reflected at all levels. GINFORS is a global model covering the EU and the OPEC member states and their most important trade partners. Using this model, Lutz and Meyer [11] analyse possible alternations to the economy

and to energy production once the Kyoto protocol effectiveness expires. Ekins [3] uses this model for predicting the influence of European environment taxes on eco-innovations, whereas the EEA creates scenarios in both the GINFORS and the E3ME models [6].

In analysing the environmental tax reform effects, have been used the data from studies from which a brief characterisation is displayed in Table 1. Whereas the Czech study of 2009 [14] focuses explicitly on the prediction of single tools - the emissions taxes and the introduction of the carbon tax in the CR - the EEA and Ekins propose the assessment of the impacts at the European level.

Tab. 2: EU-27 Selected Macroeconomic Results in 2020 According to a Baseline

	GDP	Employment	CO₂
LS1	+0.6 %	+2.2 %	-15.6 %
HS1	+0.2 %	+1.1 %	-15 %
HS2	+0.5 %	+2.7 %	-25 %
S1H	-0.57 %	+0.36 %	-8.4 %
S2H	-0.3 %	+0.41 %	-8.5 %
S2HE	-0.04 %	+0.51 %	-8.4 %
S2HI	-0.24 %	+0.45 %	-8.4 %

Source: own elaboration, data from the EEA [6], Ekins [3]

2. CO₂ Emissions, GDP and the Employment Situation in the Czech Republic

■ CO₂

In the 2020 strategy, the EU committed itself to reduce the greenhouse gas emissions by 20 % (1990 = 100 %). This goal is often transformed into carbon emissions as the CO₂ proportion in the overall pollution level is the highest. The GHG reduction by 20 % corresponds to a reduction in carbon by 15 %.

In evaluating the success rate of single scenarios resulting from the environmental tax reform, the presence of carbon dioxide and the reduction thereof is assessed first. The level of the CO₂ reduction is the most important benefit; other positive macro-economic effects are merely welcome additional benefits. However, it cannot be simultaneously maintained that any measures that would lead to the reduction of the carbon presence can be considered effective. Also the cost aspect of these

measures should be borne in mind as the implementation of the environmental tax reform has its winners and losers.

Ekins assumes the highest CO₂ reduction in the LS1 scenario. The predicted reduction by 22 % without a doubt exceeds even the EU-assumed average reduction (-15.6 %). The author believes that the extent of the carbon dioxide reduction should depend on the following national factors: the size of the energy production branches, fuel-energy mix sources (e.g. the more coal featured, the higher the conviction for the necessity for a more radical emission reduction); the extent of energy raw materials taxation (the higher the fossil fuel tax, the more readily the fuel is substituted for and, consequently, the emissions once again decrease), and the energy demand structure (when branches are featured that can readily exchange their fuels, such as the transport industry).

The EEA study assigns to the CR a reduction in emissions of 8 % compared to

Tab. 3:

Selected Macroeconomic Results for the Czech Republic in 2020 according to a Baseline

	GDP	Employment	CO₂
LS1	+0.9 %	+4.2 %	-22 %
S2H	+0.45 %	+0.5 %	-8 %
S1	-0.04 %	0 %	-1.8 %
S2	-0.05 %	-0.01 %	-3.5 %
S3	-0.08 %	-0.03 %	-3.5 %

Source: own elaboration, data from the EEA [6], Ekins [3] and Ščasný [14]

the baseline; the overall reduction in 2020 to reach the demanded level of 15 %. The CO₂ reduction is mostly found wanting in those countries possessing a high energy-demanding economy and low prices for energy products. The CR meets both criteria – its energy demand is over the EU average, whereas the price level is below average (taxed/untaxed – Refer to Table 4). Primarily two factors give rise to the diverging results in the LS1 and S2H scenarios. In the EEA study, the baseline is defined as emanating from the high prices of raw materials in the international market; the development of carbon prices estimate differs as well. Whereas Ekins in the LS1 envisages the carbon price to reach the level up to 142 EUR/t_{CO₂ 2008}, the EEA predicts the price to become much lower, at around the 61 EUR level. Both studies, in agreement with one another, assume that the Czech Republic, in concordance with the other EU member states, shall meet their obligations ensuing from their national strategies for achieving the objectives of the Europe 2020 Union Plan.

The actual situation in the realm of the Czech energy production mix indicates that coal still remains dominant and that prices and taxes are moderate (as compared to the EU average). The last approved revision of the 2010 Czech Government Energy Concept (CGEC) envisages the additional development of coal-based energy production but with the introduction of limitations on mining whereby it stresses the development of highly effective technologies with clean combustion [13]. The reduction in the proportion of coal in the energy mix is envisaged not sooner than in 2020 when coal resources shall be gradually replaced by nuclear energy. The increase of production and energy consumption is envisaged to continue

until the year 2035. After this, a phase with the raw materials energy demand gradually declining will follow thanks to technologies ensuring a higher exploitation of resources. This scenario does not reflect the European Commission plans for the expectations of the positive impacts of such reforms, as well as the stagnation in the demand for raw materials already in existence during this decade [2].

The Czech S1-S3 scenarios reflect more the reality of the Czech energy policy and the CGEC. Therefore, the carbon dioxide emissions reduction planned is also much lower. The carbon reduction is least impacted by emission taxes and better results are achieved in scenarios that include environmental tax reform. Surprisingly, no additional CO₂ reduction is present in the scenario that includes the carbon tax also for the transport sector. In the S2 and S3 models, a significantly lower carbon price is assumed on the 20 EUR/t_{CO₂ 2008} level. Even the authors themselves admit that such a low price cannot act as a motivation for replacing carbon-demanding technologies. Also, the environmental tax reform concept applied in this study is only considered to be a the fiscally neutral tool, whereby it also does not examine options that possibly offer additional subventions into eco-innovations that are adequately covered by a portion of the ETR revenues.

■ **Gross Domestic Product**

Also in this category, various scenarios manifested differing results. The most favourable economic growth for the Czech Republic is predicted by Ekins. On the contrary, the existence of a negligible influence of the ETR on the GDP appears in the S1-S3 scenarios. Ekins believes that the ETR should result in two macro-economic effects. The first effect

indicates a drop in the level of the real income of households as well as the level of EU competitiveness on international markets. The second one reveals a more positive character – the fiscal neutrality of the EU should result in a reduction in the labour costs, thereby increasing employment and, subsequently giving rise to an increase in economic growth. The final result is a combination of both effects. On the one hand for some member states, the negative effect will prevail. For the CR, the effect 2 shall prevail and result in a slightly above-average growth in comparison with the rest of the EU. Moderate economic growth should prevail in the overall European context. The degree of competitiveness among the member states should not alter in relations to the other member states as the author assumes the implementation of the reform throughout the EU. The GDP should primarily drop in those states in which there is an increase in the inflation rate (due to an increase in prices for the final energy-demanding holdings as the production factor), and a deteriorating in the level of competitiveness would have a negative impact on the trade balance. The structure of industry and some specific behavioural patterns are additional variables. On the contrary, those economic systems that, thanks to a reduction in labour costs, shall create the most employment opportunities and, thus, also increase the consumption of households in turn shall benefit (primarily the economic systems with a high proportion of consumption in the GDP generation, e.g. Slovakia).

The EEA study assumes a moderate drop in the production level of the EU average; however, an increase of 0.45 % emerges from the scenario for the CR. This is because of the low carbon energy prices in the CR giving rise to their more dramatic increase as a result of the carbon tax. Relatively high revenues may significantly influence a reduction in labour costs (thanks to the reduction in the social benefits financed by employees) and the employment growth and, thus, also the production level in general. The minimising of the degree of economic decline is ensured by scenarios that take into consideration the revenue but not the fiscal neutrality. A portion of the revenues (mostly 10 %) is reinvested into eco-innovations which reduces the carbon price but

simultaneously embodies an efficient form of support for the new branch which devotes itself to the development of new low-carbon technologies. The development of this branch is accompanied by an increase in employment opportunities. An even greater effect is brought to bear on the scenario that envisages a higher involvement of other states outside of the EU in reducing the greenhouse gases emissions. The S2HE scenario assumes the growth of the international demand for low-carbon technologies that could be partially met by the dynamically developing branch within the EU.

Virtually no impacts on economic growth are present in S1-S3 Czech scenarios. The carbon tax effect is slightly more distinctive as its revenues are higher than those from the emissions tax. Higher revenues inevitably mean a higher recycling opportunity rendering a more distinctive impact on macro-economic indexes. The question still remains as to how an increase in the price of the final holdings shall manifest itself in the demand for these holdings as the flexibility of the demand price for various categories of these holdings is differs.

■ Employment

The most positive and thus optimistic results for the CR and the entire EU can once again be found in the Ekins's study. Within the EU, up to 5 million new job opportunities could be created by 2020 as a result of implementing the environmental tax reform. There is a close relation between the employment growth and economic growth whereby employment is one the basic factors in economic growth. According to the author, new job opportunities should then emerge in sectors demanding the labour production factors (services, retail); on the contrary, a slowdown shall occur in material- and energy-demanding branches (e.g. metallurgy).

Also the EEA assumes the same employment growth at the European level; however, its estimate is more modest. Overall, 1 million new job opportunities should be created in the member states by 2020 with exception of Estonia and Portugal. An overall strengthening of the sector linked to the exploitation of renewable energies (RES) should become a significant factor. The RES development should thereby ensure that the EU economies in general become more competitive at the international level.

Tab. 4:

Selected Macroeconomic Results for the Reference Groups According to a Baseline

	CO ₂ 2010 against the 1990	CO ₂ 2020 LS1	CO ₂ 2020 S2H	GDP 2010 – 2011 growth	GDP 2020 LS1	GDP 2020 S2H	u 2011	u 2020 LS1	u 2020 S2H
Czech Republic	75 %	-22 %	-8 %	1.7 %	0.9 %	0.45 %	6.6 %	-4.2 %	-0.5 %
Slovakia	68 %	-14.1 %	-13.5 %	3.3 %	2.7 %	0.8 %	13.6 %	-2.7 %	-0.14 %
Poland	93 %	-22.2 %	-16 %	4.3 %	2.3 %	-0.4 %	9.7 %	-2.3 %	-0.2 %
Hungary	74 %	-7.3 %	-6.5 %	1.6 %	-0.2 %	1 %	10.5 %	-1.6 %	-0.04 %
Latvia	48 %	-0.1 %	-18.5 %	4.4 %	0 %	0.8 %	16.2 %	-1.3 %	-1.2 %
Lithuania	45 %	-0.7 %	-17 %	5.9 %	1.0 %	0.5 %	13.2 %	-2.1 %	-1.5 %
Estonia	53 %	-8 %	-18 %	8.3 %	1.1 %	-1.8 %	10.2 %	+3.6 %	+0.1 %
Malta	158 %	-13 %	-7.5 %	1.9 %	0.1 %	-0.8 %	6.2 %	-0.1 %	-0.8 %

Note: u = unemployment

Source: own elaboration, data from the EEA [6], Ekins [3], Eurostat

In a similar fashion, the GDP's, as well the ETR's influence on employment should be negligible in the S1-S3 scenarios. Economical forms of the environmental tax reform don't

result in either the development of a new branch, or with a statistically significant employment growth in clean technologies.

Tab.5:

Electricity Tariffs and Energy Intensity in Selected EU Countries

	Electricity prices 2010 households – excluding taxes kWh (€)	Electricity prices 2010 households – including taxes kWh (€)	Electricity prices 2010 industrial – excluding taxes kWh (€)	Electricity prices 2010 industrial – including taxes kWh (€)	Energy intensity of the economy 2010, gross inland consumption kgoe/ GDP in 1000 Euro
Czech Republic	0.115	0.139	0.107	0.13	374,5870
EU 27 Ø	0.15	0.157	0.092	0.122	152,0800
Slovakia	0.138	0.164	0.119	0.143	371,3410
Poland	0.108	0.138	0.094	0.12	330,5470
Hungary	0.125	0.157	0.103	0.131	295,4940
Estonia	0.071	0.1	0.06	0.087	545,8710
Latvia	0.095	0.105	0.091	0.11	363,3370
Lithuania	0.101	0.122	0.1	0.127	311,0550
Malta	0.162	0.17	0.148	0.189	169,2020

Source: own elaboration, based on data from Eurostat

3. A Comparison of the CR with Other Reference Groups

The reference groups were put together according to the following criteria. Firstly, the

results were compared with some other Visegrad 4 members for reasons of the regional, historical and economic vicinity between the countries of Poland, Czech Republic, Hungary

and Slovakia. The other group consist of Baltic states that are able to reduce successfully their carbon dioxide emissions at the fastest pace (although they do not belong to the lowest carbon dioxide producers in terms of absolute values). In stark contrast to those countries, Malta is, according to the Eurostat, the least successful reducer of greenhouse gases emissions.

The following analysis proposes the confirmation of two hypotheses outlined by the previous studies:

- The lowest drop in the rate of CO₂ emissions occurs in those states where there is a sufficient space for significant taxation owing to low energy prices, as well as in the more energy-demanding economic systems.
- A casual connection exists between the employment growth and the GDP growth rate.

The results presented in Table 4 and 5 demonstrate clearly that the hypotheses are not effective in all cases. For instance, a moderate employment growth occurs in Poland according to the S2H scenario; nevertheless, the ultimate GDP size decreases. A similar result is in the case for Hungary in the LS1 scenario. In Hungary, the additional tax burden shall, due to relatively high energy prices, increase the price to the level, which shall project itself to the level of the price of the final holdings thereby, decreasing the amount of available revenue in households. The reduced consumption on the part of households must then result in a more negative outcome for Hungary's overall economic income.

Quite unique significance are the ETR effects in the LS1 scenario for Estonia. According to the model, the unemployment rate should decrease by 3.6 % due to the environmental tax reform, and the GDP should increase by 1.1 % by the year 2020. On the contrary, the S2H model takes into consideration a minimum employment drop (by 0.1 %), accompanied by a decrease in the GDP by 1.8 %. Although Estonia belongs to those countries able to reduce dramatically the overall volume of greenhouse gases, it simultaneously is categorised amongst those with the most energy-demanding economic systems in the EU. This is due to its use of a relatively specific mix of primary energy sources based on the bituminous shale [16]. Without economic motivation, Estonia

won't be considering giving up the exploitation of its shale and the local economies could become less competitive in the case of other countries supporting the RES.

Conclusion

In contrast to foreign studies, the S1-S3 scenarios are much more diligent in specifying the positive impacts of the ETR on economies and on the reduction of carbon dioxide emissions. In addition to differently set up parameters employed as a models (the less carbon price and thus lower generated revenues – in the S2 to S3 models), this is also due to the following factors:

- The Czech environmental tax reform has been accepted in a narrow sense. It is apprehended as a tool for reducing negative externalities, but fiscal neutrality is simultaneously perceived as budget neutrality. Foreign studies indicate that as long as a part of the revenues is designed for eco-innovations and the support of clean technology branches, an additional advantage should arise in the form of the employment growth, as well as GDP growth.
- The Czech scenarios reflect Czech energy objectives rather than those of the CR obligations towards European strategy objectives for the year 2020. At the international level, the Czech Republic has undertaken to fulfill specific environmental goals and, at the same time, it is developing its own energy strategy that is considerably in contradiction to these obligations. It does not revoke its commitments fully, but postpones their implementation until after the year 2035. This somewhat schizophrenic attitude reveals also its attitude towards the ETR. Although it endorses in principle support for the CGEC with respect to the next stage of the environmental tax reform, no specific measures were have been concerning the implementation thereof so far.

The best results for the Czech Republic were obtained by the Ekins scenario S2H. A minor success is predicted by a scenario with 10 % of the ETR revenues for ecoinnovation (EEA). The degree of success by Ščasný et al. is related to the scale of environmental

taxation, while the extent of emissions is reduced by a greater taxation range and the negative socio-economic impacts are not significantly worsening. Differences in the results are to some extent influenced by the model in which they were calculated. Nevertheless, the results show:

- The Czech Republic can not reduce emissions with the current taxation rate (assuming no cut in the production level).
- Even the most pessimistic scenarios reckon with some minor socio-economic impacts.
- The increase of the economy and the employment growth rate could be influenced in the long term by eco-innovations, that will become more in demand from abroad.
- With respect to competitiveness, the scenario results indicate, that if the EU remains alone in the effort to reduce emission limits, the ETR cost side could be worsened. On the contrary by means of consensus at the international level and by the determination of some tax yield specifically for ecoinnovations, the level of competitiveness at the EU level as well as for the Czech Republic may increase. The world demand for clean-technology will rise and Europe will be in a position to be able to offer this owing to the targeted stimulus package.

The European Union and its member states have recently been searching for an answer to the question as to how to improve the employment situation as well as the level of competitiveness. In addition to being an effective tool in supporting the arrival of a low-carbon economic system, the ETR is also an opportunity for stimulating the economic growth and for the reduction of unemployment. Even prior to the announced intention to introduce the carbon tax at the all-encompassing European level, a number of member states had already implemented this kind of tax in advance. With regarding the uncoordinated cooperation among the states, the rules for taxing were often modified and in a number of cases various producers were declared tax exempt. The states that were initially willing to levy the negative externalities had to modify their original plans for taxation in order not to reduce the competitiveness of their own economies. It can be substantiated that these

isolated efforts did not indeed subsequently lead to an adequate reduction of carbon dioxide emissions, and the costs resulting from the frequent changes in regulation exceeded the respective benefits arising from the revenues.

Now, the environmental tax reform may well have a chance in all the Union's member states. It is up to the Czech Republic how it will deal with this opportunity. As long as its implementation is just partial or incomplete, the costs incurred may exceed the revenues and the level of competitiveness on the part of the energy-demanding economics within the RES area will be reduced.

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Doručeno redakci: 9. 11. 2012

Recenzováno: 15. 12. 2012, 6. 2. 2013

Schváleno k publikování: 4. 7. 2013

ENVIRONMENTAL TAX REFORM SCENARIOS ANALYSIS

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The triad – economics – environment – energy (E3) has become one of the most dynamically developing areas even at the EU level. The following article proposes the evaluation of the environmental tax reform (ETR) as an economic tool for all of the E3 sectors. ETR is an important tool in reducing greenhouse gas emissions and, simultaneously, it can positively impact the economic growth and employment rate. Three fundamental studies and their differing ETR scenarios have been selected and examined taking into consideration various oil-prices, carbon-prices, greenhouse gas emission targets, revenue recycling methods and scales of ETR. This article deals with the possible ETR impacts on CO₂ emissions, the GDP and the employment situation in the Czech Republic and substantiates the conclusions of some selected scenarios as well as outlines some prerequisites for the ETR implementation in the Czech Republic. The reference groups were put together to check the impact on selected EU countries and thus confirm or disprove the resulting conditions with a positive impact at the macro-economic level. The results depend on a combination of the following factors; the domestic market energy price, the economy's energy demand, and the proportion of fossil fuels in the energy mix. Based on these findings, the Czech Republic has, assuming the commitments from the Europe 2020 Strategy are adhered to, good prerequisites for the ETR implementation. Some positive effects would be more visible should the Czech environmental tax reform not be accepted in such a narrow sense. Foreign studies indicate that as long as a part of the revenues is designed for eco-innovations and the support of clean technology branches, an additional advantage should result in the form of employment growth, as well as GDP growth.

Key Words: environmental tax reform, eco-innovation, E3, competitiveness.

JEL Classification: H23, Q47, Q52.